New definitions of the classification of numbers.

Juan Elias Millas Vera

juanmillaszgz@gmail.com

Zaragoza (Spain)

April 2021

0- Abstract:

Using definitions and properties of sets I made a complete classification of all possible existing numbers. I used different variables and define them as known sets.

1- Even and odd numbers:

In this part we are going to see a basic definitions, first the even numbers are defined inside the ring of the integers:

$$(1)\quad e=2n \qquad \forall (e,n)\in\mathbb{Z}$$

We can also define odd numbers in a similar form:

$$(2)\quad o=2n+1 \qquad \forall (o,n)\in\mathbb{Z}$$

Now we are going to explain this types of numbers as contrary:

$$(3)\quad \neg e=o$$

$$(4)\quad \neg o=e$$

2 – Prime and semiprime numbers:

To understand the prime numbers and its properties we should first define the composite numbers:

$$(5)\quad k=n\cdot m \qquad \forall (n,m)\in(\mathbb{N}-1)\,\forall\, k\in Composite$$

Now we can do a negation on the composites to obtain the set of primes plus the number one:

$$(6)\quad \neg k=t+1 \qquad \forall\, k\in Composite\,\forall\, t\in Prime$$

With the propositions (5) and (6) we can resume it as:

$$(7)\quad k+\neg k=n\cdot m+t+1=a \qquad \forall\, k\in Composite\,\forall\, t\in Prime\,\forall (n.m)\in(\mathbb{N}-1)\,\forall\, a\in\mathbb{N}$$

Now we are going to define the semiprimes with the previous work:

$$(8)\quad t\cdot t=q \qquad \forall\, t\in Prime\,\forall\, q\in SemiPrime$$

3 – Definition decimal periodic number.

This type of numbers inside the ring of rational numbers have various properties. The goal is define all of the types using only natural and integer numbers.
We are going to start with terminating decimal numbers:

$$(9) \quad s_1 = a/b = c,d \qquad \forall (a,b,c) \in \mathbb{Z}\ \forall d \in \mathbb{N}\ \forall s \in \mathbb{Q}$$

Next, we are going to define recurring decimal numbers:

- Pure periodic decimals:

$$(10) \quad s_2 = a/b = c,\overbrace{ddd\ldots}^{\infty} \qquad \forall (a,b,c) \in \mathbb{Z}\ \forall d \in \mathbb{N}\ \forall s \in \mathbb{Q}$$

$$(11) \quad s_3 = a/b = c,\underbrace{\overbrace{def\ldots}^{n}\overbrace{def\ldots}^{n}\overbrace{def\ldots}^{n}}_{\infty} \qquad \forall (a,b,c) \in \mathbb{Z}\ \forall (d,e,f) \in \mathbb{N}\ \forall s \in \mathbb{Q}$$

- Ultimately period decimal numbers:

$$(12) \quad s_4 = a/b = c,d\overbrace{eee\ldots}^{\infty} \qquad \forall (a,b,c) \in \mathbb{Z}\ \forall (d,e) \in \mathbb{N}\ \forall s \in \mathbb{Q}$$

$$(13) \quad s_3 = a/b = c,d\underbrace{\overbrace{efg\ldots}^{n}\overbrace{efg\ldots}^{n}\overbrace{efg\ldots}^{n}}_{\infty} \qquad \forall (a,b,c) \in \mathbb{Z}\ \forall (d,e,f,g) \in \mathbb{N}\ \forall s \in \mathbb{Q}$$

4 – Irrational numbers:

In this type on numbers we have a decimal part with infinite non repeatable sequence.

$$(14) \quad p = a/b = c,\overbrace{def\ldots}^{\infty} \qquad \forall (a,b,c) \in \mathbb{Z}\ \forall (d,e,f,\ldots) \in \mathbb{N}\ \forall p \in I$$

5 – Real numbers definitions:

Here we are going to use the classic form to make this special numbers:

$$(15) \quad a = \sqrt{-b} \qquad \forall b \in \mathbb{N}\ \forall a \in \mathbb{R}$$